

## BOOK REVIEWS

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**The American Mineralogical Journal Conducted by Archibald Bruce, M.D. Vol. I.** (Facsimile of the 1814 Edition). Introduction by *John C. Greene*, Foreword by *George W. White*. Hafner Publishing Co., New York and London. 1968. xvii+272 p. \$18.00.

When, in 1810, the first issue of the *American Mineralogical Journal*, edited by Dr. Archibald Bruce, appeared, American science achieved a landmark. It was the first truly specialized scientific journal to be published in this country. In 1811, the second issue was offered to the public and two subsequent issues followed. Finally in 1814, the four separates were collected into a single volume. A facsimile of this volume has become the first publication in the series, "Contributions to the History of Geology" edited by George W. White. White happily selected John C. Greene to write the introduction for the work. Greene discusses Bruce's aims in starting the journal, and, more importantly, establishes how the articles he printed both reflected and participated in the main stream of British and Continental geology, mineralogy, and chemistry. Most of the papers in the *American Mineralogical Journal* were original contributions from a small group of American workers who were connected with the French followers of the Abbé Haüy and with the "rump" group of British geologists who had defied Sir Joseph Banks by establishing a Geological Society. As a result, this short-lived work was highly regarded on the other side of the Atlantic. Eventually it was extended, as the *American Journal of Science*, by Benjamin Silliman.

Bruce said the object of his journal was collecting and recording "such information as may serve to elucidate the Mineralogy of the United States, than which there is no part of the habitable globe which presents to the mineralogist a richer or more extensive field for investigation." He cast his editorial net over a wider area, however, for he also included papers on geology and chemistry. The chief American mineralogists to contribute were Robert Gilmor of Baltimore, Colonel George Gibbs, and Bruce himself. Dr. Samuel Akerley, Samuel Latham Mitchell, Dr. William Meade, and Benjamin Silliman provided the "geological mineralogy" papers. Silliman also contributed papers inspired by Humphry Davy's electrolytic decomposition of potash and soda, as did Thomas Cooper and George Chilton. Other chemical papers dealt with the use of Robert Hare's blow-pipe. There are, in addition, papers in the field of technology, including descriptions of iron works, potassium nitrate works, mining operations, and the like. From these pages one can begin to see how scientists, technologists, and artisans interacted as they began the exploitation of the mineral resources of this continent.

This reprint, enriched by Greene's introduction, should be valuable to historians of science and technology, and to cultural historians as well. One regrets only the price of the book, which may prevent some from owning it.

J. Z. FULLMER

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**The Collected Works of Count Rumford. Vol. III, Devices and Techniques. Vol. IV, Light and Armament. Vol. V, Public Institutions.** *Sanborn C. Brown, Editor.* Belknap Press of Harvard University Press, Cambridge, Mass. 1969 and 1970. x+504 p; x+503 p; xii+512 p. \$10.00, each volume.

These three volumes continue and conclude the reprinting of the collected works of Benjamin Thompson, Count Rumford. Some additions have been made to the older—and now scarce—edition. An index has been added to each volume; in the final volume the separate indexes have been combined, a great convenience to the user. Two papers previously not included have been added. Volume III now contains a paper on the physical properties of silk, read to the Royal Society in 1787, but not published in *Philosophical Transactions*. Brown in his introduction accounts for the omission. Volume IV now contains Rumford's work on light dispersion, including his demonstration of the optical properties of ground-glass lamp shades. This paper was read originally to the French Institut in 1806; what is reproduced here is the English translation made by W. A. Cadell and corrected by Rumford for publication in Nicholson's *Journal*.

As is obvious from the sub-title of each volume, Brown has preserved in this edition the same divisions between the papers established by the American Academy of Arts in 1875. The Victorians were much concerned with the problem they usually discussed under the rubric, "The Unity of the Sciences;" for many of them the existence or absence of this "unity" was, indeed, a problem. Historians now realize that what troubled the Victorians, perhaps subconsciously, was the artificiality of the division. For example, Rumford's ideas of heat cannot be disentangled from his notions about how fire-places and cook-stoves should be built; this complex led naturally to his suggestions about general health and its relation to physical surround-

ings. He held all of these ideas nearly simultaneously; they were part of his total intellectual *Weltanschauung*. To have the papers reproduced following the Victorian subdivisions into "Light and Armament" and "Public Institutions", for example, emphasizes a wrong aspect, for any such division is arbitrary. To-day we might have preferred a chronological listing (not always easy in Rumford's case, because of his publishing habits) so that clues to Rumford's intellectual development might have become more apparent. Whatever the arrangement, however, it is especially important to have all the papers available, each with their appropriate bibliographical citations. This reprinting will be welcomed by historians of science, social historians, and students of the late-eighteenth century.

Belknap Press is to be congratulated for the attractive format, and for keeping the price per volume within reason. One regrets that the handsome dust-jackets are doomed by libraries to such a short life.

J. Z. FULLMER

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**Classics in Coordination Chemistry. Part I: The Selected Papers of Alfred Werner.** Translated, edited, and with commentary by *George B. Kauffman*. Classics of Science, Volume IV. Dover Publications, New York (paperback). 1968. xvi+190 p. \$2.50.

With the publication of his coordination theory, Alfred Werner in 1893 at once revitalized an inorganic chemistry grown moribund, and brought together by his theory inorganic and organic compounds to form anew a unified chemistry. Prof. Kauffman, Werner's biographer, has here edited, translated, and commented upon six of Werner's basic papers in the field. The first, a translation of Werner's paper which appeared in 1893, *Zeitschrift für anorganische Chemie*, explains the coordination number of a compound, and accounts for certain observed chemical reactions of what are now called "Werner complexes," by recourse to stereochemistry. In the second paper, translated from the *Zeitschrift für physikalische Chemie* of the same year, Werner and his friend and colleague, Arturo Miolati, provide the first published experimental data supporting the coordination theory, based on their conductivity studies. The third paper continues a report of their demonstration, and appeared in 1894. It was not until 1907 that Werner was able to announce in the *Berichte* that he had overcome the experimental difficulties involved and prepared the cis-trans isomers of 1,2-dichloro—tetrammine-cobalt salts. This important paper offers further brilliant confirmation of the coordination theory, for only this theory predicted such isomerism. The two final papers in this collection demonstrate why asymmetric compounds exist and, in addition, show that it was possible to synthesize an optically active compound containing no carbon atoms.

Kauffman's translations are splendid, and his introductions, although brief, are useful. The reader is again reminded, as he turns these pages, of how the scientific innovator sets the style for all subsequent work in the field, for the pattern developed in Werner's papers is one which still prevails in literature whenever coordination compounds are discussed. Although these papers were written long ago, they have still a freshness and vitality which merits their inclusion in a series devoted to "classics" of science. Not only will coordination chemists welcome this handy volume, but practicing chemists and historians of science as well will find it useful.

J. Z. FULLMER

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**Population, Resources, Environment, Issues in Human Ecology.** *Paul Ehrlich and Anne Ehrlich*. W. H. Freeman and Co., San Francisco. 1970. 383 p. \$8.95.

As you are well aware, the earth's diminishing resources, pollution, and overpopulation have recently become popular subjects. Because of this concern, there has been a proliferation of facts, figures, and predicted dangers, both real and imagined, spread across both the scientific and popular literature. Indeed there has been such an explosion of this information that it has become difficult for the scientist, let alone the concerned layman, to collect and combine these opinions and data into an intelligible discourse. Generally this has been accomplished by Paul and Anne Ehrlich in this book, *Population, Resources, Environment*.

This book is composed of 13 chapters, six appendices, and a general bibliography. Of the 13 chapters, six deal more or less specifically with man's population crisis, and four additional ones with the effects this crisis has had on various ecosystems and components of ecosystems. The remainder of the chapters are concerned with potential political ramifications of and solutions to our environmental crises, both domestic and international. The appendices abound with information and contain such things as seven pages of world demographic data and four pages of important pesticides, their uses and mammalian toxicities.

The majority of the chapters are complete and packed full of interesting facts and figures. A number of biogeochemical cycles, including those of certain "unnatural" substances such as DDT, energy flow through communities, the greenhouse effect, stability of ecosystems, and other ecological principles and problems are clearly explained and well illustrated. Major segments of Chapter 6, "Environmental Threats to Man," however, should have been expanded. Much

more attention, for example, should have been centered on the effects, particularly behavioral, of the predicted continuing urbanization on man.

A variety of potential, although perhaps unlikely, threats to man are also treated in this chapter. For example, there is a discussion of the potential effects of contrails produced by jet aircraft altering the jet streams, and of the potential for a plague of some origin sweeping the world. The choice of the Marburg virus as an example of the latter point was unfortunate, since it has been found that this virus is transmitted only through direct contact with the infected organs of the monkey. Nevertheless, as they point out, it is an inescapable fact that, as human populations and movements increase and resources decrease, the potential for pandemics increases alarmingly.

While many oversimplified, non-ecological solutions to the current ecological crises are being presented by a variety of "save-the-environment groups," the Ehrlichs show a rare understanding, albeit with a tinge of idealism, of the total ecological picture. A particularly good example is their discussion of the food problem in underdeveloped ("never to be developed") countries. They point out that the problem is not only one of attempting to increase food production, but also of economical distribution, particularly to populations located long distances from food-production centers.

That this same logic was not applied to their discussion of the fate of junk autos in the United States is unfortunate. Recycling of materials is a necessity, but it is hard to imagine the economic incentive in attempting to reclaim discarded automobiles from areas of the United States with small populations and limited transportation facilities.

Examples of sound ecological thought can be found throughout the book and offset certain minor inaccuracies. The sacred cow "problem" in India is tackled, for example, in this manner. Traditionally the western answer to the protein problem in India has been to have the Indians eat the cows. It is pointed out by the Ehrlichs that the cows consume mostly forage and wastes and do not compete with man for food and that cow dung is used as a major fuel source in India—if the cattle were removed, India's coal production would have to be increased nearly 50%.

Perhaps the greatest accomplishment of this book, however, is not in delineating where we are, but in presenting a constructive program of where we can go and how to get there. No "pie-in-the-sky," "destroy-the-'system'," "close-General-Motors" suggestions are made. Instead the Ehrlichs seem to have grasped the *realpolitik* of the situation. This seems best exemplified in their section "Recommendations: A Positive Program," where they state: "The program should be based on what politicians understand best—votes."

Finally it should not be forgotten that this book was, by design, not written as an objective scientific treatise, but rather as a potential sourcebook, and, quite frankly, as a stage for two reputable, concerned ecologists to express their views of our most pressing environmental problems. As they state, "We do not believe that such minor errors as might be revealed in our figures, estimates, or interpretations will change the thrust of our major conclusions . . . and we make no apology either for our selection of subjects or for the personal style and approach we have used throughout. We have not attempted to give equal weight to both sides of all controversial issues; where we think our side is correct we have so indicated."

We were pleased with the book and found it to be readable and illustrative, if not somewhat frightening. We believe that it would be an excellent source-book for advanced high school students, college undergraduates, and concerned laymen. Because of its heavy emphasis on population problems, sometimes at the expense of basic ecological principles, we recommend that it be used as a textbook in undergraduate courses only if the instructor is prepared to develop his own lectures and handouts to backstop the book.

WILLARD C. MCCARTNEY and WILLIAM B. JACKSON

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**Science in Antiquity.** *Benjamin Farrington.* Second edition. Oxford University Press, London, Oxford, and New York (paperback). 1969. vii+156 p. \$1.50.

When, in 1936, the first edition of Farrington's *Science in Antiquity* appeared, it was immediately heralded as a useful introduction to ancient science, both for the general reader, the beginning classicist, and the science historian. For several years the book has been out of print; to have a revised edition available is a welcome turn of events. The new edition differs from the old chiefly by offering an expanded section on Aristotle, and in the revision of the material on the decline of ancient science. In addition, Farrington has supplied references to the original sources, and brought the Bibliography, which lists book-length secondary sources and commentaries, up to date.

The value of the book, undiminished in this new edition, lies in Farrington's view of ancient science as part of the total Greek culture. Farrington says that, with the Greeks, a "new and most important element" . . . "the element of speculative philosophy, which constitutes the specific quality, the real originality, of Greek science" entered the world. Further, he says, it was this "gift for speculation by which the Greeks transformed the heritage of the older civilizations into the first unified rational system of natural philosophy."

The time span of the book is from the approximate origins of Greek science in the sixth cen-

ture B.C. to its decline in the sixth century A.D. The scientific ideas and the practical, technological achievements that Farrington sees are related both to the non-Greek world that came before and the changes Greek science inspired long after its actual decline.

Perhaps the best section of the book, which is a very good one, is that dealing with Aristotle. Farrington shows in a splendid way "that the career of Aristotle represents a progress from Socratic idealism, through the later Platonic recognition of the importance of sense knowledge, to a complete restoration of the practice of research as it had culminated among the Ionian Greeks in the Hippocratic school," whereupon the ground was cleared for the "restoration of the experimental and observational study of nature." Finally Farrington in a brief chapter discusses the complex relationship between Christianity and scientific decline.

For those who used the first edition, this new issue will be welcome. For those who did not, be they advanced scholar or beginner, this book will prove to be pleasant and informative reading.

J. Z. FULLMER

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**Induction and Intuition in Scientific Thought.** *Peter Brian Medawar.* Volume 75, *Memoirs of the American Philosophical Society*, Philadelphia. 1969. xi+62 p. \$2.00.

At the University of Pennsylvania in the spring of 1968, Sir Peter Medawar, Director of the National Institute for Medical Research in London, delivered the Jayne lectures. In these, he attempted to answer the question: "By what method (or methods) do scientists work?", but approached the problem through another question, viz., "Why are most scientists completely indifferent to—even contemptuous of—scientific methodology?" Having shown that the indifference exists "because what passes for scientific methodology is a misrepresentation of what scientists do or ought to do," Medawar is free to deal with his basic problem. In his second lecture he shows how limiting the concept of "induction" actually is; while inductivism may be involved in the justification process, it falls lamentably short of being descriptive of the process of discovery. The third lecture, "mainly about Intuition" tells about the difficulties involved in assuming that the hypothetico-deductive scheme provides an accurate description of how the scientist works.

This brief description of these lectures is, however, far too bald to do justice to Medawar's lectures. Repeatedly he has drawn on his own experience in developing his own scientific insights, on the experience of close colleagues, and on his own wide reading. Medawar has already given up his *Art of the Soluble*; this new volume, brief but richly thoughtful, is a worthy companion to it. The book should prove attractive to all practising scientists, to philosophers of science, and to science historians as well.

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